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Gratke

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(54) **MICROPHONE ASSEMBLY FOR USE WITH AN AFTERMARKET TELEMATICS UNIT**

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H04R 9/08	(2006.01)
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CPC ***H04R 1/406*** (2013.01)
USPC **381/86**; 381/91; 381/111; 381/354; 381/356

(58) **Field of Classification Search**

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USPC 381/86, 91, 92, 122, 87, 354, 365, 356, 381/361, 369, 337, 339, 345, 351, 111–117
See application file for complete search history.

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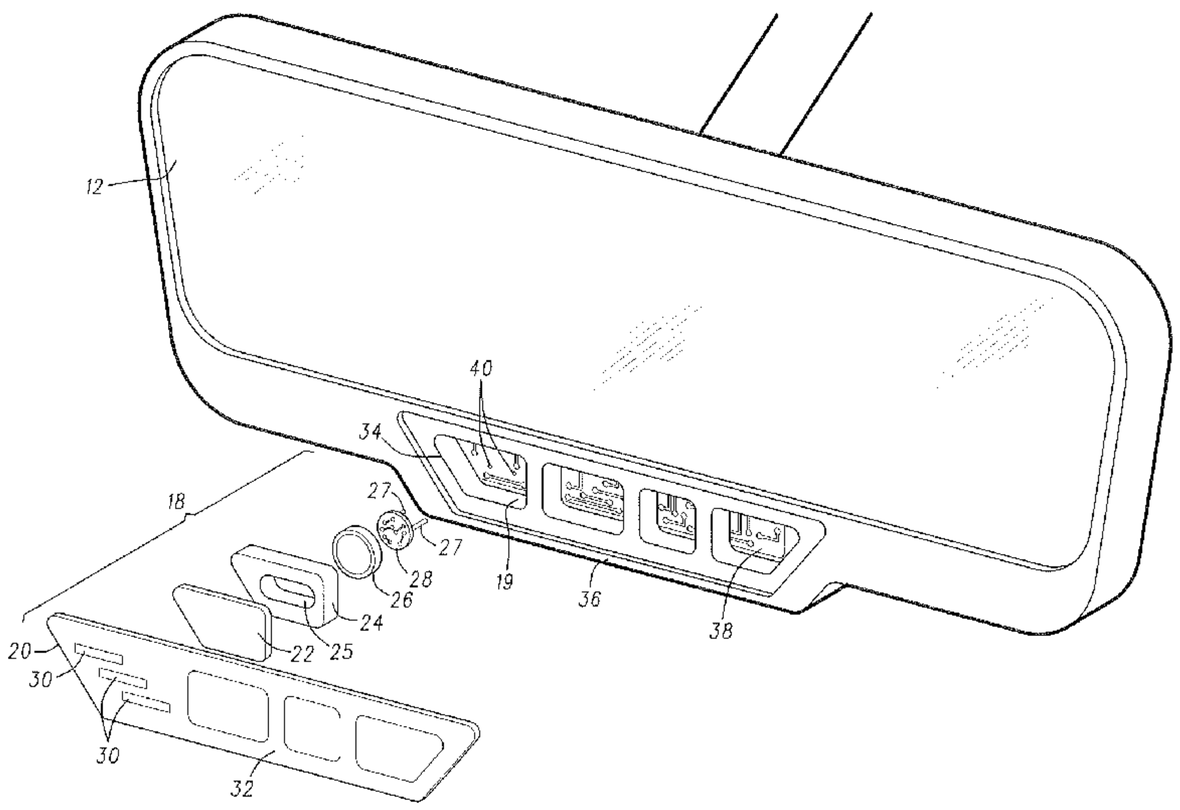
(57) **ABSTRACT**

A microphone assembly for use with an aftermarket telematics unit mounted in a passenger compartment of a vehicle is disclosed herein. The aftermarket telematics unit has a chamber having an opening that generally faces towards a rear of the vehicle and the microphone assembly includes, but is not limited to, a directional wideband microphone disposed within the chamber. A preamplifier is internally mounted within the directional wideband microphone. The preamplifier has an electrical lead and is both electrically and structurally attached to the aftermarket telematics unit via the electrical lead. The electrical lead is the sole means of physical attachment between the directional wideband microphone and the preamplifier, on the one hand, and the aftermarket telematics unit on the other hand.

20 Claims, 3 Drawing Sheets



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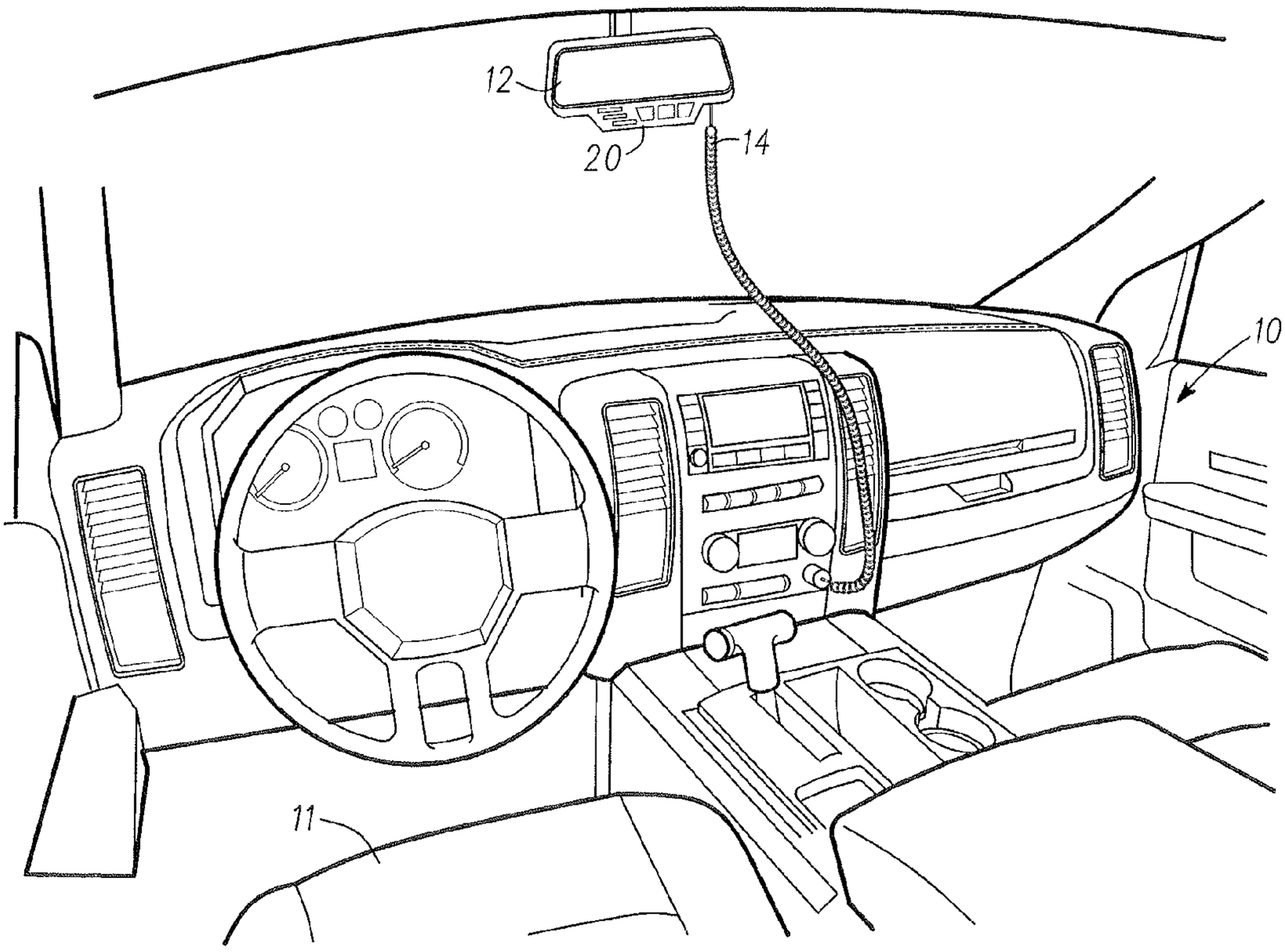

Fig. 1

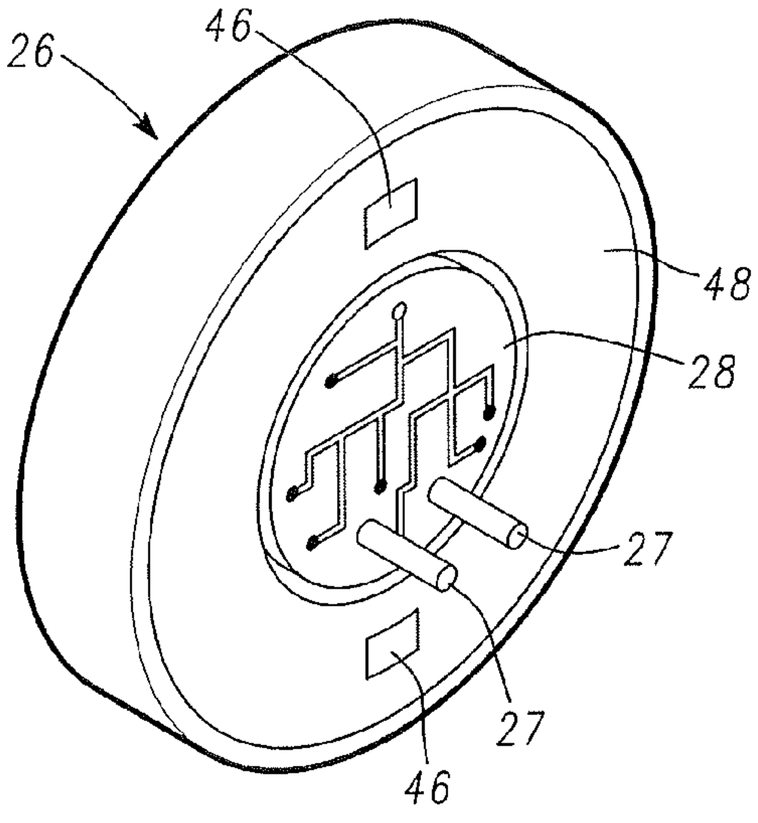

Fig. 4

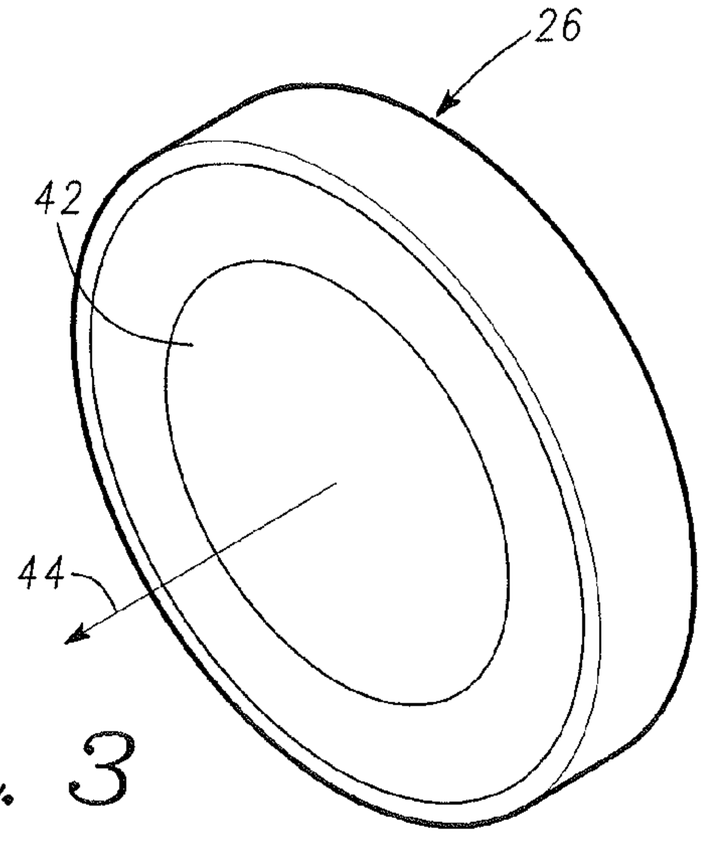

Fig. 3

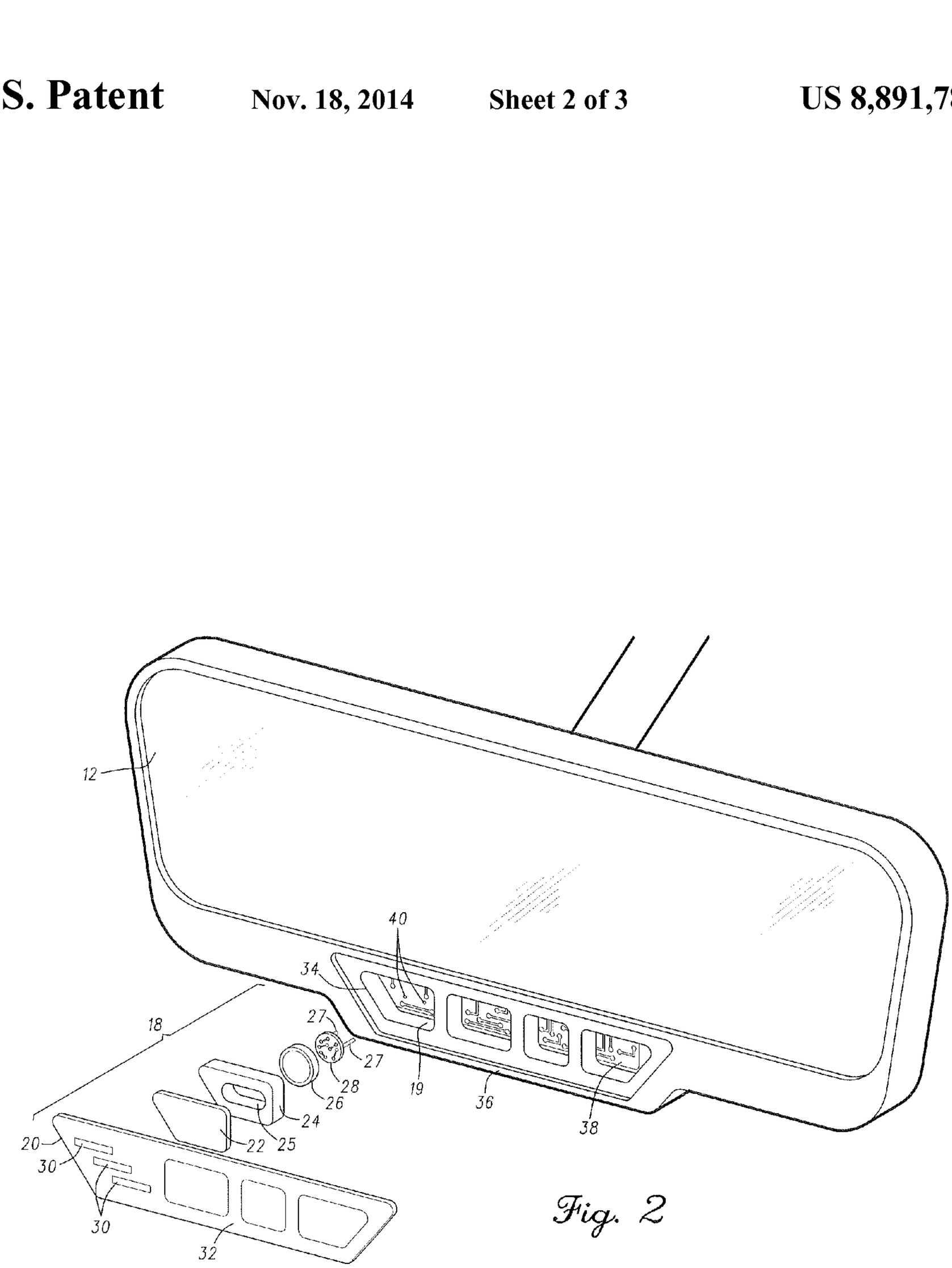

Fig. 2

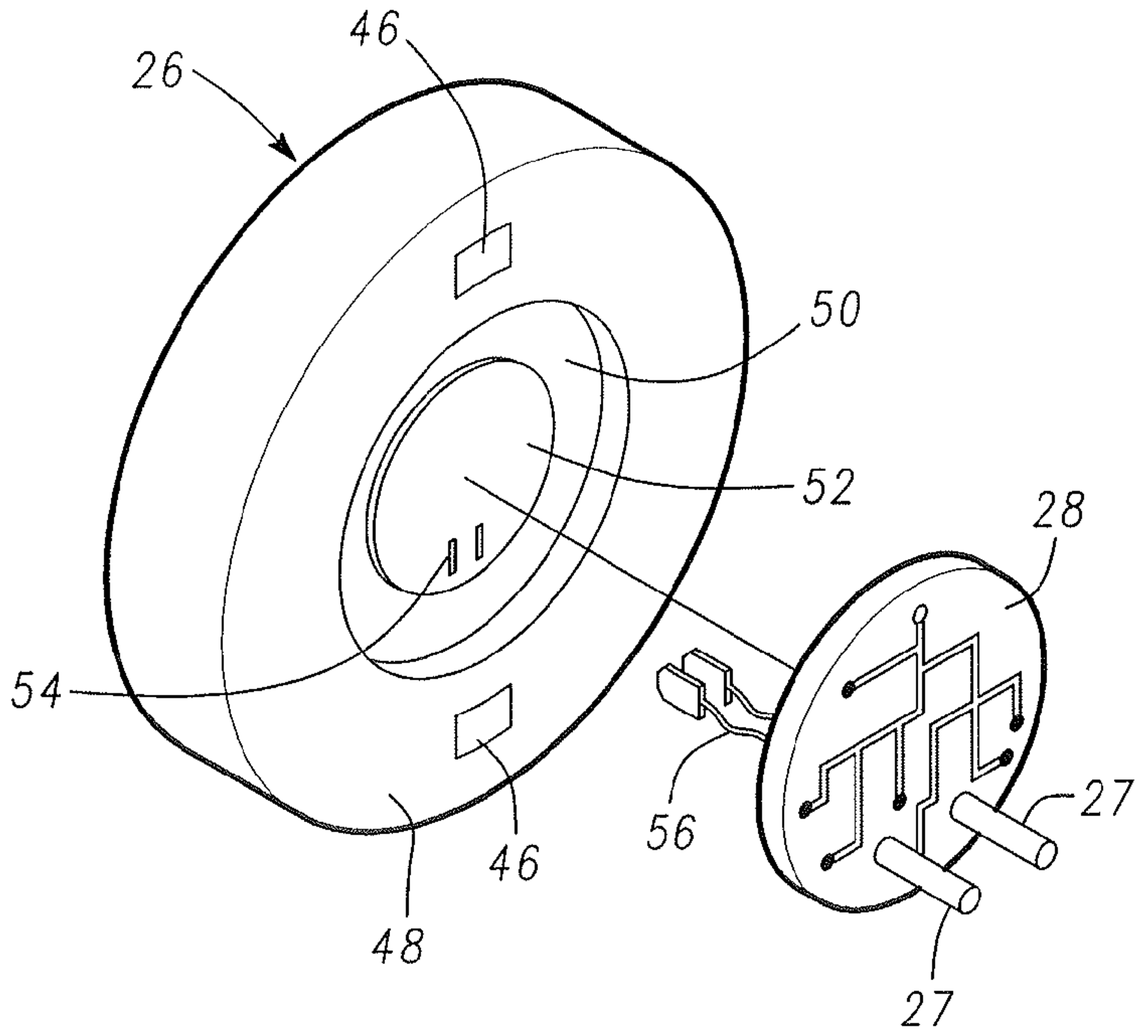
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Fig. 5

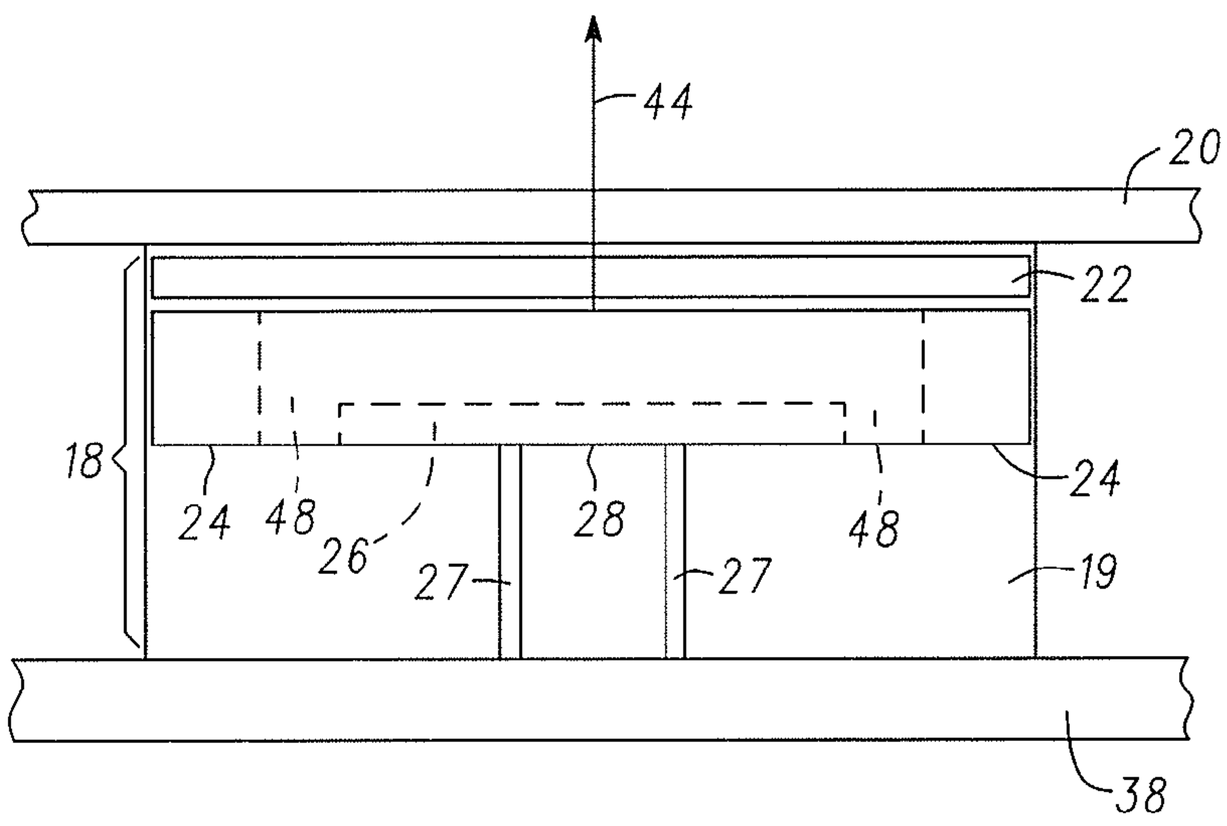
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Fig. 6

MICROPHONE ASSEMBLY FOR USE WITH AN AFTERMARKET TELEMATICS UNIT

TECHNICAL FIELD

The technical field generally relates to microphone assemblies, and more particularly relates to microphone assemblies for use with an aftermarket telematics unit.

BACKGROUND

Telematics services are those services that are provided by a remotely located call center to a vehicle and/or to an operator of the vehicle via an automatic and/or on-demand communications link connecting the call center to the vehicle. The use of telematics services by vehicle operators has grown steadily since such services first became available. Some of the more common telematics services include, but are not limited to, turn-by-turn navigation guidance, assistance during times of emergency, cellular telephone services, and the remote monitoring of a vehicle's maintenance requirements.

A vehicle that is capable of providing its driver with such telematics services typically includes an embedded telematics unit that is integrated into the vehicle and that is configured to communicate with the remotely located call center. The remotely located call center is configured, equipped and staffed to provide the above services (as well as others) to a vehicle operator through communications with the vehicle and/or the driver via the embedded telematics unit.

In a typical example, the driver will press a button or other control device in the vehicle requesting assistance from the call center. The button press will cause the embedded telematics unit to initiate a cellular telephone call to the call center. After an initial exchange of data between the telematics unit and the call center, voice communications will be established to permit an advisor at the call center to speak with the driver. To facilitate such voice communications, a directional wideband microphone having a wideband frequency response is included in the vehicle and is communicatively connected to the telematics unit.

The location where the directional wideband microphone is positioned in the vehicle has evolved over the years. Initially, the directional wideband microphone was mounted to the rear view mirror. In some instances, it was mounted to the bottom of the mirror and in other instances, it was mounted to the top. While both locations were acceptable, they each had drawbacks. The position beneath the mirror placed the directional wideband microphone close to the vehicle's stereo speakers and the vehicle's heating, ventilation, and air conditioning (HVAC) ducts, each of which emitted sound when utilized. The position above the mirror resulted in the directional wideband microphone's acoustic axis being directed up into the vehicle's headliner which is an inherently sound deadening material. Accordingly, both locations could potentially interfere with the directional wideband microphone's receptivity to sound energy, and could, as a result, diminish the microphone's ability to detect the vehicle occupant's voice.

Because of these drawbacks, designers began to explore positioning the directional wideband microphone at locations other than in or on the mirror. For example, directional wideband microphones were mounted in overhead consoles and in A-pillars. By positioning the directional wideband microphones in these locations, designers achieved better results, i.e., the directional wideband microphones experienced less interference from the radio and the HVAC ducts and therefore better maintained their wideband receptivity.

Because of the popularity of the above described telematics services, aftermarket telematics units are beginning to enter the market place. Such aftermarket telematics units make it possible for drivers of vehicles that lack an embedded telematics unit to, nevertheless, receive some or all of the telematics services available to drivers having vehicles with embedded telematics units. These aftermarket telematics units are self contained units that have many or all of the components of an embedded telematics unit.

Many of these aftermarket telematics units are in the form of a rear view mirror and are intended to replace the rear view mirror that comes with the vehicle. These aftermarket telematics units also include a directional wideband microphone to facilitate voice communications between the driver of the vehicle and the call center. The directional wideband microphones mounted in such aftermarket telematics units may therefore encounter the same sources of noise and interference that previously lead designers to move the directional wideband microphones out of the mirrors to other parts of the vehicle interior.

Another consideration is the effect that the packaging/mounting of the directional wideband microphone will have on the microphone's wideband receptivity. It has been observed that the greater the number of attachment points or the greater the area of attachment between a wideband microphone and the body to which it is mounted, the more vibrations from vehicle and vehicle systems will interfere with the directional wideband microphone's wideband receptivity. Because existing directional wideband microphone assemblies are packaged in a rigid housing made of hard plastic, and because the housings are relatively large, simply inserting the microphone assembly into the aftermarket telematics unit may result in large areas of contact between rigid, vibration transmitting surfaces.

SUMMARY

A microphone assembly is disclosed herein for use with an aftermarket telematics unit mounted in a passenger compartment of a vehicle. The aftermarket telematics unit has a chamber having an opening that generally faces towards a rear of the vehicle.

In a non-limiting example, the microphone assembly includes, but is not limited to, a directional wideband microphone disposed within the chamber. A preamplifier is mounted at least partially within the directional wideband microphone. The preamplifier has an electrical lead for both electrically connecting and structurally attaching to the aftermarket telematics unit. The directional wideband microphone and the preamplifier are fixed to the aftermarket telematics unit solely via the electrical lead.

In another non-limiting example, wherein the aftermarket telematics unit further includes a Printed Circuit Board (PCB board) to control various functions of the aftermarket telematics unit, the microphone assembly includes, but is not limited to, a directional wideband microphone that is disposed within the chamber. A preamplifier is mounted at least partially within the directional wideband microphone. The preamplifier has an electrical lead for both electrically connecting and structurally attaching to the PCB board. The directional wideband microphone and the preamplifier are fixed to the aftermarket telematics unit solely via the electrical lead.

In another non-limiting example, wherein the aftermarket telematics unit further includes a PCB board to control various functions of the aftermarket telematics unit, the microphone assembly includes, but is not limited to, a directional wideband microphone disposed within the chamber and hav-

ing an acoustic axis. The directional wideband microphone is oriented within the chamber such that the acoustic axis is directed through the opening and towards the rear of the vehicle. A preamplifier is mounted at least partially within the directional wideband microphone. The preamplifier has an electrical lead for both electrically connecting and structurally attaching to the aftermarket telematics unit. A grill member is positioned to cover the opening. The grill member has a plurality of grill openings that are sized to render the grill member acoustically transparent. A foam body is disposed within the chamber. The foam body is positioned between the directional wideband microphone and the opening. The foam body has a density that is effective to resist a transmission of sound energy of a predetermined frequency. A boot is positioned around the directional wideband microphone. The boot is acoustically transparent. The boot comprises an elastomeric material. An outer surface of the boot is contoured to substantially conform to an internal portion of the chamber. The directional wideband microphone and the preamplifier are fixed to the aftermarket telematics unit solely via the electrical lead. The directional wideband microphone is disposed within the chamber such that a rear surface of the directional wideband microphone is spaced apart from any other surface by at least two millimeters.

DESCRIPTION OF THE DRAWINGS

One or more examples will hereinafter be described in conjunction with the following drawing figures, wherein like numerals denote like elements, and

FIG. **1** is a perspective view illustrating an interior of a vehicle equipped with an aftermarket telematics unit having an example of a microphone assembly disclosed herein;

FIG. **2** is an exploded view illustrating the components of the microphone assembly embedded in the aftermarket telematics unit of FIG. **1**;

FIG. **3** is a perspective view illustrating a front portion of the directional wideband microphone illustrated in FIG. **2**;

FIG. **4** is a perspective view illustrating a rear portion of the directional wideband microphone of FIG. **3** and internally mounted preamplifier of FIG. **3**;

FIG. **5** is an exploded view illustrating an arrangement between the directional wideband microphone and the internally mounted preamplifier; and

FIG. **6** is a schematic top view illustrating an example of a microphone assembly made in accordance with the teachings herein.

DETAILED DESCRIPTION

The following detailed description is merely exemplary in nature and is not intended to limit application and uses. Furthermore, there is no intention to be bound by any expressed or implied theory presented in the preceding technical field, background, brief summary or the following detailed description.

An improved microphone assembly for use with an aftermarket telematics unit is disclosed herein. In a non-limiting example, the microphone assembly includes a directional wideband microphone that is mounted in an aftermarket telematics unit. The aftermarket telematics unit includes a chamber extending inwardly from a front surface of the aftermarket telematics unit. A preamplifier, including an electrical lead, is mounted within the directional wideband microphone. The directional wideband microphone is positioned within the chamber and the electrical lead is attached to the aftermarket telematics unit. The electrical lead, or leads if more than one electrical lead is present, is/are the sole point of attachment, both structurally and electrically, between the directional wideband microphone and the preamplifier, on the one hand, and the aftermarket telematics unit on the other hand.

The placement of the directional wideband microphone in a chamber having an opening that faces towards the rear of the vehicle (i.e., towards the passenger compartment in cases where the aftermarket telematics unit comprises a rear view mirror) helps to ensure good sound receptivity and thus avoids the drawbacks associated with mounting the microphone assembly on top of, or underneath, the rear view mirror, as discussed above. The minimal area of attachment between the directional wideband microphone and the aftermarket telematics unit helps to minimize the amount of vibration that is transferred from the aftermarket telematics unit to the directional wideband microphone.

A greater understanding of the examples of the directional wideband microphone assembly for use with an aftermarket telematics unit disclosed herein may be obtained through a review of the illustrations accompanying this application together with a review of the detailed description that follows.

FIG. **1** is a perspective view illustrating an interior **10** of a vehicle. Although interior **10** is illustrated as the interior of a passenger vehicle, it should be understood that telematics unit **12**, and the microphone assembly contained therein, may be used in any type of vehicle, including, but not limited to, commercial vehicles, trucks, recreational vehicles, construction related vehicles, or any other type of automobile. A driver seat **11** is mounted within interior **10** and is configured to support a human occupant. Interior **10** is further equipped with an aftermarket telematics unit **12** positioned forward of driver seat **11**. Aftermarket telematics unit **12** includes an example of a microphone assembly disclosed herein.

Aftermarket telematics unit **12** is a self contained telematics unit that is compatible with a communication system that is configured to communicatively connect a vehicle to a call center (not shown). The call center is configured to provide several automatic and on-demand services for the vehicle and for an occupant/owner of the vehicle. A communication system of the sort that aftermarket telematics unit **12** is compatible with is disclosed in a pending U.S. patent application having the Ser. No. 12/548,148 filed on Aug. 26, 2009 and Ser. No. 12/683,040 filed on Jan. 6, 2010, each of which is hereby incorporated herein by reference in its entirety. Aftermarket telematics units are disclosed in a pending U.S. patent application having the Ser. No. 12/787,472 filed on May 26, 2010, and in U.S. Publication No. 2005/0273211 published on Dec. 8, 2005, each of which is hereby incorporated herein by reference in its entirety.

In FIG. **1**, aftermarket telematics unit **12** is configured as a windshield-mounted rear-view mirror. In other examples, aftermarket telematics unit **12** may take any other suitable form, including, but not limited to, a navigation system, a radio, a cellular telephone, a portable device, or any other component configured to be mounted within interior **10**.

Aftermarket telematics unit **12** includes a power cord **14** that is adapted to draw power from an electrical outlet mounted within interior **10**. In other examples, aftermarket telematics unit **12** may be battery operated or may draw electrical power from some other source.

In the example illustrated in FIG. **1**, a grill **20** is positioned over an opening into a chamber that extends inwardly into aftermarket telematics unit **12**. The microphone assembly of the present disclosure is mounted within the chamber and

grill **20** closes the chamber to protect the microphone assembly and other components from dust, particulates, debris, and other contaminants.

FIG. **2** is an exploded view illustrating the components of a microphone assembly **18** mounted within a chamber **19** in the aftermarket telematics unit of FIG. **1**. In the illustrated example, microphone assembly **18** includes grill **20**, foam body **22**, a boot **24**, a directional wideband microphone **26**, and a preamplifier **28**. In other examples a greater or lesser number of components may be included without departing from the teachings herein. For instance, in some examples, microphone assembly **18** may include only directional wideband microphone **26** and preamplifier **28**, while in other examples, microphone assembly **18** may include each of the illustrated components plus a mesh cloth disposed between foam body **22** and grill **20**.

Grill **20** may comprise a plastic material, a metal material, or any other material that is conducive to the transmission of sound to directional wideband microphone **26**. Grill **20** includes three substantially parallel slots **30** defined in a surface **32** of grill **20** and extending completely through grill **20**. These three substantially parallel slots provide an unobstructed pathway for the transmission of sound through grill **20** to directional wideband microphone **26**.

When the combined open area of substantially parallel slots **30** exceeds a certain magnitude, grill **20** will be acoustically transparent, meaning that the amount of sound energy that will reach directional wideband microphone **26** after passing through grill **20** is substantially equal to the amount of sound energy that would reach directional wideband microphone **26** if grill **20** were not present. It has been observed that, in some examples, when the combined open area of substantially parallel slots **30** is equal to or exceeds 41.3 mm^2, then grill **20** will be acoustically transparent. It should be understood that openings in grill **20** having other configurations may also be employed without departing from the teachings of the present disclosure. Furthermore, such other configurations may provide a combined opening that is sufficiently large to render grill **20** acoustically transparent. For example, it has been observed that an arrangement of small, circular openings having a combined open area of 37.7 mm^2 will render grill **20** acoustically transparent.

Foam body **22** is a foam component that is disposed within chamber **19** and positioned between grill **20** and a front portion of directional wideband microphone **26**. Foam body **22** is configured to provide acoustic resistance to sound energy passing through chamber **19**. The presence of foam body **22** in front of directional wideband microphone **26** in chamber **19** serves to dampen any echoes and/or reverberation caused by sound reflecting off of the walls of chamber **19**. In some examples, foam body **22** may have a density that is more resistive to sound energy propagating at a specific frequency than sound energy propagating at other frequencies. This allows a designer to tune microphone assembly **18** to partially filter out sound of a specific or undesirable frequency. Due to the directional nature of directional wideband microphone **26**, it may be desirable to avoid positioning foam body **22**, or any portion thereof, behind directional wideband microphone **26**.

Boot **24** is a housing that is configured to receive directional wideband microphone **26**. In the illustrated example, boot **24** is configured and contoured to substantially conform to the shape of chamber **19**. In this way, boot **24** holds directional wideband microphone **26** in a desired position and orientation within chamber **19**, and inhibits movement of directional wideband microphone **26** from such desired position and orientation despite the occurrence of jostling and turbulence such as is typically experienced and encountered by components mounted to a vehicle. Furthermore, to avoid transmitting vibrations from the vehicle to directional wideband microphone **26**, boot **24** is preferably made from an elastomeric or rubber material, and is therefore suitable for absorbing such vibrations before they can reach directional wideband microphone **26**.

Boot **24** includes an opening **25** that extends completely through boot **24**. Opening **25** permits front and rear portions of directional wideband microphone **26** to receive sound energy in an unobstructed manner and therefore avoids adversely impacting the ability of directional wideband microphone **26** to receive sound energy. Accordingly, boot **24** is acoustically transparent when directional wideband microphone **26** is seated within boot **24**.

In the illustrated example, directional wideband microphone **26** is an electret condenser microphone that is configured to receive sound energy at both a front surface (visible in FIG. **2**) and a rear surface (as best seen in FIGS. **4** and **5**). Directional wideband microphones of the type illustrated in FIG. **2** are widely available in the market place. One known manufacturer, GoerTek, sells a suitable directional wideband microphone under the model number B9750UP123-11. As is well known in the microphone arts, directional wideband microphones are configured to discern time lapses between the receipt of sound energy from its front and rear surfaces, and to process signals corresponding to the sound energy received at both the front and rear surfaces in a manner that permits directional wideband microphones to be more attuned to, and to be better able to detect sounds transmitted from a specific direction. The direction in which a directional wideband microphone is more attuned and better able to detect sounds is referred to herein as a directional wideband microphone's "acoustic axis". In the illustrated example, directional wideband microphone **26** has an acoustic axis that extends generally perpendicularly to a front face of directional wideband microphone **26**. Accordingly, when seated within chamber **19**, the acoustic axis is directed through grill **20** and towards a rear portion of interior **10**.

Preamplifier **28** serves to amplify a low-level signal such as is commonly generated by a microphone. Preamplifier's typically provide a voltage gain without any significant current gain and are commonly incorporated into the housing or chassis of the amplifier that they feed. Preamplifiers of the type illustrated in FIG. **2** are widely available in the market place. As discussed below, preamplifier **28** is mounted within, and is electrically connected to, directional wideband microphone **26**. Preamplifier **28** includes a pair of electrical leads **27** which are configured to carry power and electronic signals between preamplifier **28** and aftermarket telematics unit **12**.

In the illustrated example, aftermarket telematics unit **12** is configured as a rear view mirror and includes chamber **19** extending inward into aftermarket telematics unit **12**. Chamber **19** has an opening **34** defined in a front face **36** of aftermarket telematics unit **12**. As a result of this configuration, when aftermarket telematics unit **12** is mounted in interior **10**, opening **34** faces generally towards the rear of interior **10**. Consequently, microphone assembly **18** is mounted such that it generally faces towards an occupant of driver seat **11**.

Aftermarket telematics unit **12** includes a PCB board **38** that, in some examples, is configured to control operations of aftermarket telematics unit **12**. PCB board **38** includes a connector **40** comprising a pair of openings that are configured to receive electrical leads **27**. Once electrical leads **27** are inserted into connector **40**, directional wideband microphone **26** and preamplifier **28** are electrically connected to aftermarket telematics unit **12** and physically attached thereto. To

minimize the transmission of vibrations from aftermarket telematics unit **12** to directional wideband microphone **26**, this connection between electrical leads **27** and connector **40** is the sole means of physical attachment between directional wideband microphone **26** and preamplifier **28**, on the one hand, and aftermarket telematics unit **12** on the other hand. Accordingly, wideband microphone **26** and preamplier **28** are essentially suspended within chamber **19** via electrical leads **27**. Electrical leads **27** may be permanently affixed to PCB board **38** such as through the use of a solder joint. For example, electrical leads **27** may protrude through PCB board **38** and solder may be applied to attach the end portions of electrical leads **27** to a rear portion of PCB board **38**. In other examples, lead wires may be attached (e.g. soldered) to electrical leads **27** and then electrical connectors may be affixed to the lead wires. The electrical connectors may then be attached to a connector on PCB board **38**. In some examples, intermediate connectors may be employed to connect the electrical connectors of electrical leads **27** to an electrical connector mounted to PCB board **38**.

FIG. **3** is a perspective view illustrating a front portion of directional wideband microphone **26** and preamplifier **28**. Directional wideband microphone includes a diaphragm **42** incorporated into a front surface. Diaphragm **42** vibrates in response to sound waves that impacts diaphragm **42** and generates a corresponding electronic signal. Acoustic axis **44** projects outwardly from directional wideband microphone **26** in an orientation that is substantially perpendicular to diaphragm **42**.

FIG. **4** is a perspective view illustrating a rear portion of directional wideband microphone **26** and internally mounted preamplifier **28**. With continuing reference to FIG. **3**, openings **46** are defined in a rear surface **48** to receive sound energy reaching a rear portion of directional wideband microphone **26**. Directional wideband microphone **26** is configured to employ a sound cancelling technique that utilizes the sound energy entering through openings **46** to form an acoustic axis **44** that extends outwardly from diaphragm **42** in a direction that is generally transverse to diaphragm **42**.

FIG. **5** is an exploded view illustrating an arrangement between directional wideband microphone **26** and preamplifier **28**. As illustrated, directional wideband microphone **26** includes an opening **50** configured to receive preamplifier **28**. In some examples, preamplifier **28** may snap-fit into opening **50**. In other examples, an adhesive may be used to mount preamplifier to directional wideband microphone **26**. In other examples, any suitable type of fastening may be employed.

In addition, directional wideband microphone **26** includes an electrical connector **52** including a pair of plug openings **54** that are configured to receive a pair of electrical connectors **56**. Once electrical connectors **56** are received within plug openings **54**, directional wideband microphone **26** and preamplifier **28** are electrically connected and signals may be sent by directional wideband microphone **26** and received by preamplifier **28**.

FIG. **6** is a schematic top view illustrating an example of microphone assembly **18**. In this illustration it can be seen that there are substantially no components positioned within chamber **19** that are disposed between rear surface **48** of directional wideband microphone **26** and PCB board **38**. By keeping this region substantially free of components and other matter, there is nothing to obstruct the transmission of sound energy into openings **46** (see FIGS. **4** and **5**). Such unobstructed space avoids interfering with the directional characteristics of directional wideband microphone **26**. In some examples, it has been observed that when the distance between rear surface **48** and PCB board **38** is at least two millimeters, the directional characteristics of directional wideband microphone **26** will not be negatively affected.

When microphone assembly **18** is situated in chamber **19** in the manner illustrated, a front surface of directional wideband microphone **26** faces in the direction of grill **20** and acoustic axis **44** is projected through grill **20** and towards a rear portion of interior **10**. As a result of this orientation, acoustic axis **44** is generally directed towards an occupant of driver seat **11** and is therefore better able to discern voice commands coming from a driver or occupant of the vehicle.

While at least one example has been presented in the foregoing detailed description, it should be appreciated that a vast number of variations exist. It should also be appreciated that the examples shown and described are not intended to limit the scope, applicability, or configuration in any way. Rather, the foregoing detailed description will provide those skilled in the art with a convenient road map for implementing the examples discussed herein. It should be understood that various changes can be made in the function and arrangement of elements without departing from the scope as set forth in the appended claims and the legal equivalents thereof.

What is claimed is:

1. A microphone assembly for use with an aftermarket telematics unit mounted in a passenger compartment of a vehicle, the aftermarket telematics unit having a chamber having an opening that generally faces towards a rear of the vehicle, the microphone assembly comprising:

a directional wideband microphone disposed within the chamber, and

a preamplifier mounted at least partially within the directional wideband microphone, the preamplifier having a pair of electrical leads for both electrically connecting and structurally attaching to the aftermarket telematics unit,

wherein the directional wideband microphone and the preamplifier are mounted to the aftermarket telematics unit via the pair of electrical leads such that the pair of electrical leads are the sole points of attachment of the directional wideband microphone and the preamplifier with the aftermarket telematics unit, wherein each electrical lead of the pair of electrical leads are spaced apart from one another, and wherein the pair of electrical leads cooperate to stand off a rear surface of the directional wideband microphone and a rear surface of the preamplifier from a surface of the aftermarket telematics unit.

2. The microphone assembly of claim **1**, wherein the directional wideband microphone has an acoustic axis and wherein the directional wideband microphone is oriented within the chamber such that the acoustic axis is directed through the opening and towards the rear of the vehicle in a direction that is at least substantially perpendicular to a front face of the directional wideband microphone.

3. The microphone assembly of claim **1**, further comprising a grill member positioned to cover the opening, the grill member having a plurality of grill openings that are sized to render the grill member acoustically transparent.

4. The microphone assembly of claim **3**, wherein the plurality of grill openings comprise substantially parallel slots.

5. The microphone assembly of claim **4**, wherein the substantially parallel slots have a combined open area of at least 41.3 mm^2.

6. The microphone assembly of claim **3**, wherein the plurality of grill openings comprises a plurality of circular openings having a combined open area of at least 37.7 mm^2.

7. The microphone assembly of claim **1**, wherein the directional wideband microphone is disposed within the chamber

such that a rear surface of the directional wideband microphone is spaced apart from any other surface.

8. The microphone assembly of claim **7**, wherein the directional wideband microphone is spaced apart from any other surface by at least two millimeters.

9. The microphone assembly of claim **1**, further comprising a foam body disposed within the chamber, the foam body being positioned between the directional wideband microphone and the opening.

10. The microphone assembly of claim **9**, wherein the foam body has a density that is effective to resist a transmission of sound energy of a predetermined frequency.

11. The microphone assembly of claim **1**, further comprising a boot positioned around the directional wideband microphone, the boot being acoustically transparent and comprising an elastomeric material.

12. The microphone assembly of claim **11**, wherein an outer surface of the boot is contoured to substantially conform to an internal portion of the chamber.

13. A microphone assembly for use with an aftermarket telematics unit mounted in a passenger compartment of a vehicle, the aftermarket telematics unit having a Printed Circuit Board (PCB board) to control various functions of the aftermarket telematics unit, the aftermarket telematics unit further having a chamber having an opening that generally faces towards a rear of the vehicle, the microphone assembly comprising:

a directional wideband microphone disposed within the chamber, and

a preamplifier mounted at least partially within the directional wideband microphone, the preamplifier having a pair of electrical leads for both electrically connecting and structurally attaching to the PCB board,

wherein the directional wideband microphone and the preamplifier are mounted to the aftermarket telematics unit via the pair of electrical leads such that the pair of electrical leads are the sole points of attachment of the directional wideband microphone and the preamplifier with the aftermarket telematics unit, wherein each electrical lead of the pair of electrical leads are spaced apart from one another, and wherein the pair of electrical leads cooperate to stand off a rear surface of the directional wideband microphone and a rear surface of the preamplifier from a surface of the aftermarket telematics unit.

14. The microphone assembly of claim **13**, wherein the directional wideband microphone has an acoustic axis and wherein the directional wideband microphone is oriented within the chamber such that the acoustic axis is directed through the opening and towards the rear of the vehicle in a direction that is at least substantially perpendicular to a front face of the aftermarket telematics unit.

15. The microphone assembly of claim **13**, further comprising a grill member positioned to cover the opening, the grill member having a plurality of grill openings that are sized to render the grill member acoustically transparent.

16. The microphone assembly of claim **15**, wherein the plurality of grill openings comprise substantially parallel slots.

17. The microphone assembly of claim **13**, wherein the directional wideband microphone is disposed within the chamber such that a rear surface of the directional wideband microphone is spaced apart from any other surface.

18. The microphone assembly of claim **17**, wherein the directional wideband microphone is spaced apart from any other surface by at least two millimeters.

19. The microphone assembly of claim **13**, further comprising;

a foam body disposed within the chamber, the foam body being positioned between the directional wideband microphone and the opening, the foam body having a density that is effective to resist transmission of sound energy of a predetermined frequency; and

a boot positioned around the directional wideband microphone, the boot being acoustically transparent, the boot comprising an elastomeric material, and an outer surface of the boot being contoured to substantially conform to an internal portion of the chamber.

20. A microphone assembly for use with an aftermarket telematics unit mounted in a passenger compartment of a vehicle, the aftermarket telematics unit having a Printed Circuit Board (PCB board) to control various functions of the aftermarket telematics unit, the aftermarket telematics unit further having a chamber having an opening that generally faces towards a rear of the vehicle, the microphone assembly comprising:

a directional wideband microphone disposed within the chamber and having an acoustic axis, the directional wideband microphone being oriented within the chamber such that the acoustic axis is directed through the opening and towards the rear of the vehicle;

a preamplifier mounted at least partially within the directional wideband microphone, the preamplifier having a pair of electrical leads for both electrically connecting and structurally attaching to the PCB board,

a grill member positioned to cover the opening, the grill member having a plurality of grill openings that are sized to render the grill member acoustically transparent;

a foam body disposed within the chamber, the foam body being positioned between the directional wideband microphone and the opening and the foam body having a density that is effective to resist a transmission of sound energy of a predetermined frequency; and

a boot positioned around the directional wideband microphone, the boot being acoustically transparent, the boot comprising an elastomeric material, and an outer surface of the boot being contoured to substantially conform to an internal portion of the chamber,

wherein the directional wideband microphone and the preamplifier are mounted to the aftermarket telematics unit via the pair of electrical leads such that the pair of electrical leads are the sole points of attachment of the directional wideband microphone and the preamplifier with the aftermarket telematics unit, wherein each electrical lead of the pair of electrical leads are spaced apart from one another, wherein the pair of electrical leads cooperate to stand off a rear surface of the directional wideband microphone and a rear surface of the preamplifier from a surface of the aftermarket telematics unit and wherein the directional wideband microphone is disposed within the chamber such that a rear surface of the directional wideband microphone is spaced apart from any other surface by at least two millimeters.

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